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ABSTRACT

This paper reviews some of the findings of research on classroom questions, and considers ways in which sociolinguistic theory may help resolve some questions it leaves unanswered. The paper is divided into three sections, which correspond to three features of questions. The three features are the "context" of questions, the "content" of questions, and the "responses and reactions" that teachers and students have to questions. The goal is to demonstrate that research on questions must minimally consider these three features, and identify ways of describing each of the features. Each of the three sections of the paper is divided into two parts, which discuss process-product and sociolinguistic research separately. The division enables keeping the assumptions and world-views of the paradigms distinct. Although the two paradigms concern themselves with different problems, they can inform each other. Sociolinguistics can suggest some of the facets of discourse that a process-product student should consider. Sociolinguists of education should consider the lessons of process-product research as well. (JD)

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William S. Carlsen

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Questioning in Classrooms: A Sociolinguistic Perspective[1]

William S. Carlsen[2]

A Cautionary Preface

This paper is a review of research on teacher questioning. A cautionary remark is appropriate at the outset. Since much of the research literature concerned with teacher questioning is not sociolinguistic in nature, there is a mismatch between the research I will review and the analytic perspective of the review.

I do not want to build a straw paradigm just to knock it down. We could find much to criticize about any area of educational research from a different perspective. For example, from the perspective of theoretical physics, educational research has failed to consider the importance of subatomic particles. While such an analysis might be amusing, it wouldn't be helpful in our efforts to understand teaching better.

Nevertheless, an analytic mismatch can give us something valuable: a fresh perspective on some old puzzles. In this paper, I will review some of the findings of research on classroom questioning, and consider ways in which sociolinguistic theory may help us solve some unanswered puzzles.

Introduction

This paper is divided into three sections, which correspond to three features of questions. The three features are the context of questions, the

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content of questions, and the responses and reactions that teachers and students have to questions. My goals are to demonstrate that research on questions must minimally consider these three features, and identify ways of describing each of the features.

Each of the three sections of this paper is divided into two parts, which discuss process-product and sociolinguistic research separately. The division is somewhat arbitrary, especially for studies which have aspects of both research approaches (e.g., Rowe, 1974). It is an important division, however, because it enables us to keep the assumptions and world-views of the paradigms distinct.

The Context of Questions in Lessons

Discourse in classrooms can be viewed as a type of language game in which there are four possible moves: structuring, soliciting, responding and reacting. This model of school discourse, described in 1966 in The Language of the Classroom (Bellack, Kliebard, Hyman & Smith, 1966), has been useful for both process-product and sociolinguistic research in education. The two research traditions used the model in different ways, however. Process-product research conceptualized the four moves -- structuring, soliciting, responding and reacting -- as independent and has striven to describe the effects of each on product variables like student achievement. Sociolinguistic research used the model to begin developing descriptions of how speakers interact in social settings.

The first type of move, structuring, was defined by Bellack et al. as a context-establishing move. A structuring move "sets the stage" for solicitations and responses, the two moves which Bellack et al. saw as the

core of classroom discourse. In a science lesson, a typical structuring move might be to say: "Yesterday we looked at the digestive system of the pig." A typical soliciting move which might follow it: "Now, does anyone remember what the small intestine looked like?" Following a student responding move (e.g., "A tube."), the teacher may react: "Good, a tube."

Context in process-product research. Despite its original definition as a context-establishing move, the structuring move is not usually considered contextual in process-product research on teaching. Context in process-product research is usually defined as a collection of "presage" conditions: variables like student age, grade, socioeconomic status (SES), and sex. Many process-product studies of classroom questioning hold an "exclusive" approach to these conditions (Evertson and Green, 1986, p. 187). The goal of exclusive approaches is to control or minimize context factors, in order to reduce "noise" and discover general laws of behavior.

In recent years, process-product research has begun to broaden its definition of context, partly as a result of activity in other paradigms, and partly in an attempt to explain why so many of the findings of process-product research are study-specific. Proponents of process-product research argue that while not as general as originally hoped, the findings of large-sample correlational and experimental studies are meaningful if they include enough specific information about context. For example, one of the conclusions Brophy and Good (1986) draw from their recent review of process-product research is that "Even the most widely replicated process-product relationships usually must be qualified by references to the context of instruction," including the grade level of the students; student SES, ability and affect; and the teacher's stated goals and objectives (p. 365).

Curiously, although classroom questions are oral and embedded in discourse, definitions of context which consider discourse have rarely been used in process-product research. In some cases, lack of attention to discourse has been extreme: for example, Winne (1979) reviews several studies in which teachers were trained to develop questions of "higher" cognitive level (questions above the first two levels of Bloom's cognitive taxonomy; Bloom, Engelhart, Furst, Hill & Krathwohl, 1956). The teachers were sent out to classrooms, and later pupil achievement was measured with standardized tests. Conclusions were drawn about the effects of question cognitive level on achievement, even though no systematic checks were made to see whether the trained teachers actually asked more high-level questions.

When the language context of classroom questions is addressed in process-product studies, it is often controlled. One method of controlling context is to give the teacher a lesson script to read. The script contains a fixed number of questions of certain types, and affords the teacher few opportunities for modifying instruction interactively (e.g. Gall, Ward, Berliner, Cahen, Winne, Elashoff & Stanton, 1978). Studies like this sacrifice external validity for internal validity. One can be sure that the treatment condition is uniform across sample classrooms, but at a cost: stripping teaching of much of its improvisational character (see Erickson, 1982).

We can consider other types of process-product research as context-related if we adopt a sociolinguistic view of context. From such a perspective, the context of a question includes the discourse leading into the question, the previous participation of speakers, and the relationship among speakers (see Brown & Yule, 1983; Cazden, 1986; Levinson, 1983). As Ochs (1979a) points out, context "includes minimally, language users' beliefs and

assumptions about temporal, spatial, and social settings; prior, ongoing, and future actions (verbal, non-verbal), and the state of knowledge and attentiveness of those participating in the social interaction in hand" (p. 5).

Armed with this conception of context, other types of process-product research appear context-related. For example, a large number of studies have measured the frequency of teacher questions, usually as a correlate to student achievement (for reviews, see Doenau, 1987; Dunkin & Biddle, 1974; Gall, 1970; Rosenshine, 1971). While the findings of research in this area have been inconsistent regarding the effects of questioning frequency on student achievement (Rosenshine, 1971), they have pointed out how commonplace questions are in classrooms. Dunkin and Biddle (1974), for example, concluded that teacher questions consume between one-tenth and one-sixth of the time students spend in classrooms. Student questions (and studies of student questions), on the other hand, are comparatively rare (see the reviews by Gall, 1970; Medley, 1978; Rosenshine, 1976).

Although other dimensions considered in process-product research could be interpreted as contextual (e.g. student engagement), there is an inherent awkwardness in doing this. The typical units of analysis in process-product studies are students, classrooms, teachers, or schools; although the presage and process factors that impact on those individuals and organizations may be measured in a variety of creative fashions, an inevitable consequence is that details about discourse are obscured. The frequency of teacher questions in a class, for example, may be reduced to a single number. Since the distribution and function of questions over the course of the class period may vary, such a distillation means that only very superficial descriptions of context can be

inferred.

Context in sociolinguistic research. The units of analysis in sociolinguistic research -- utterances, turns, conversations -- permit a more detailed description of the context of discourse. Cazden (1986) points out that there are two slightly different meanings of context in sociolinguistic research: 1) the situation as the speaker finds it as he or she begins speaking, and 2) the conversational situation as actively modified by the speaker. Using the first meaning, context is static. When a boy answers a question posed by the teacher, his response occurs in a context defined by the teacher and any other speakers who preceded him. The second type of context recognizes the active role of each speaker in constructing context. When the teacher asks a boy a question, then follows that question with several others, the boy's early responses help define the context for his later ones.

Interpretive research methods like sociolinguistics can be used to consider context of both types in the analysis of classroom questions. They are especially well suited for the study of context of the second type, active construction of meaning -- the type of context that process-product research is unable to consider. For example, Au and Mason (1983) discovered that the traditional recitation mode of instruction, in which the teacher calls on individual students to answer questions, was ineffective with native Hawaiian students. Au and Mason noted that a native Hawaiian teacher, familiar with the implicit shared rules of Hawaiian speech, recognized that concurrent speech and other linguistic phenomena were both more familiar to the children and more effective in instruction.

Au and Mason's finding is similar to findings for other groups of speakers (e.g. Erickson & Mohatt, 1982) and can be explained in terms of

participation structures, typical arrangements of speakers and listeners with associated rules for taking part in discourse (Philips, 1972; Schultz, Erickson & Florio, 1982). The rules for a given participation structure must be understood by speakers and listeners or communication problems will result.

Lemke (1982) in an extensive report on the classroom communication of science, lists and describes several dozen common participation structures (he uses the term SitType, or situation type) in science classrooms. Each has associated with it typical speakers and patterns of communication. Science instruction can take place in predictable, orderly ways because the rules of communication in each situation are mutually understood by teacher and students. Lemke analyzes discourse in a number of these situations, and notes that questions are unevenly distributed in science classes: some situations are characterized by high rates of teacher questioning, and others by low rates. Teachers use questions in particular contexts, and research on questioning needs to recognize the strong interaction between participation structures and distribution of questions.

How do teachers indicate to students which participation structure is in effect? One way they can do this is by establishing classroom routines (Yinger, 1979). Another way is through the use of metacommunication -- talking about talking -- like, "Now we're going to review what you should have read last night" (Stubbs, 1976). A third way of communicating expected participation structure is through the use of contextualization cues. Gumperz (1982) defined these as "constellations of surface features of message form ... by which speakers and listeners interpret what the activity is, how semantic content is to be understood and how each sentence relates to what precedes or follows" (p. 31).

In his original description of contextualization cues, Gumperz used several examples to show how a listener can misinterpret an utterance when the listener and the speaker are from different cultural groups. A particular tone of voice, a gesture, or a word may be interpreted in one way by the speaker and in another way by the listener. For example, Gumperz points out that Americans use the word "may" in two ways: to mean "permission" or to mean "possibility;" natives of India use the word only to indicate permission. Hence, the sentence "The principal may come to class today," could mean one thing to an American student and something very different to an Indian student.

Contextualization cues may be a useful way for teachers to communicate to students when they may talk and when they should not talk. For example, when a teacher strings together a number of sentences with words like "and," "but," and "so," or asks a question and then immediately answers it, the astute student will probably recognize that student verbal participation is not expected, and perhaps not desired. Consider, for example, the following teacher remarks which use both of these strategies:

> So the eating disorders that I'm thinking of offhand are, um, bulimia, anorexia, and any others I-, those are the first two that came to my mind, but if you have some, um you can work with a partner, if two of you want to present the information, but, I don't want em to go more than um, ten minutes, so, um and we're only going to do that on Wednesday morning, just kinda as a offshoot to digestion, because we all y'know talk about digestion and we're going to learn all the structures and functions of, um the organs that are present there, and the glands that we use, but, what ramifications and what sorts of things, why is it important to us and what's, what's important in our lives right now? Of course, the most important thing for people your age I'm sure is eating. [Carlsen, 1988, p.55]

In this passage, a biology teacher, Ms. Ross, is making an announcement about an optional extra credit report on eating disorders. The announcement, which consists of a number of discrete propositions, is spoken as one sentence: when she pauses briefly, she inserts placeholders (the words transcribed in bold face) into her speech. Although the sentence ends with the rising intonation characteristic of a question, Ms. Ross immediately answers the question herself. No student offers an answer; Ms. Ross has already made it clear that during this part of the class, the role of the student is to listen, not talk.

Summary: The context of questions. Process-product research and sociolinguistic research use the word "context" in very different ways. In process-product research, context refers to a set of static features of people, classrooms and schools, which the researcher must hold constant by experimental control or random assignment. Features of discourse like structuring moves and the frequency of teacher questions are seen as process variables, not context, and are generally distilled down into static measurements: n structuring moves per lesson, or m teacher questions per class period.

Sociolinguistic research broadens the definition of context considerably, but at the cost of increased complexity. Context includes description of speakers and their relationships to one another, and the rules which govern their speech and enable them to make sense of what is being said. Context in sociolinguistic research also includes detailed description of the ways utterances by different speakers fit together in discourse. This theme will be returned to later in this paper, when I turn to the topic of turn-

taking.

The Content of Questions

Teachers do not just ask questions; they ask questions about something. The content of a teacher's question depends on many things: the intended function of the question (e.g., focusing attention, assessing student understanding), the teacher's understanding of the subject-matter, and other factors. The content of a question is related to its context, as well. If the teacher asks a question and a student provides an incorrect answer, the content of a followup question is likely to be related to the content of the first question. It is difficult to conceive of the following exchange taking place, for example:

TEACHER: Joy, what does the small intestine do?

JOY: It makes bile.

TEACHER: OK. Who remembers what the lining of the small intestine looks like?

If the teacher knows her subject-matter well, it is unlikely that she would let Joy's misunderstanding pass. If Joy had answered correctly (e.g., "It absorbs nutrients from the food."), on the other hand, the topic change in the teacher's question might be a sensible way of continuing to review the process of digestion.

Question content: Process-product research. Although the content of a question is critical to its meaning, the content of questions has not been directly addressed by process-product research. Inattention to the subject matter of questions in process-product research is probably attributable to

two causes. First, compared to interpretive research methods like ethnography or sociolinguistics, process-product research has tended to rely on low-inference measures (Flanders Interaction Analysis is a good example of this; Flanders, 1970); and the development of general purpose low-inference measures for describing the content of a question is problematic. Second, because the findings of process-product research are argued in statistical terms, when tradeoffs need to be made between detail and sample size, smart process-product researchers make their samples larger.

Process-product research has dealt with question content indirectly, nevertheless. One of the most vigorous and long-lived lines of questioning research has studied the effects of the cognitive level of teacher questions on student achievement. The question typically asked in studies of this type is, "What is the effect on student achievement of raising the average cognitive level of teachers' questions?"

Dozens of studies have asked this question, in numerous subject-matter classrooms, using a variety of ways of controlling the cognitive level of questions. Three reviews have analyzed the results across studies, restricting their scope to experimental and quasi-experimental designs. The first, by Winne (1979), used a simple tally approach and concluded that across studies, there appeared to be no consistent effect of increasing the number of high cognitive-level questions on achievement. The second, by Redfield and Rousseau (1981), used the more powerful technique of meta-analysis to review almost exactly the same group of studies, and concluded that high-level questions have a moderate positive influence on student achievement. The third study, by Samson, Strykowski, Weinstein and Wahlberg (1987) did a quantitative synthesis of 14 studies (most overlapped with the previous two reviews) and supported

Winne's original conclusion that large, significant effects of question cognitive level have yet to be demonstrated.

There are two possible interpretations for this back-and-forth. One interpretation is that the cognitive level of teacher questions doesn't make any difference on student achievement, or that the relationship is so weak that detection of it across studies is methodology-dependent. This interpretation is unsatisfying, however, both because it cannot account for individual studies which have found significant effects, and because it is counterintuitive. It seems plausible that a teacher who asks challenging questions encourages her students to think at a different level than a teacher who only asks rote memory questions.

A second possible interpretation of the inconsistent findings relating question cognitive level to student achievement is that researcher-rated cognitive level is only one dimension of question content. After all, the hypothesis that underlies research in this area is not that any high-level teacher question is better than any low-level question. A series of impossibly difficult questions, although high-level, would be of questionable educational worth. An assumption is made that all other things being equal, cognitive level is related to the quality of a question.

There are other measures of quality: question difficulty, divergence (how many different correct student answers are possible), and complexity (how many different questions a question contains) have also been considered independently in educational research. The results of these studies, like studies of cognitive level, are equivocal (see the review by Wilen & Clegg, 1986). A possible reason for this is that these different dimensions cannot be considered independently. Cognitive level is not a proxy for question quality.

A related problem is that measurement of question cognitive level in classrooms is a very difficult task for an outsider. The context of a question may interact with its surface form. The biological question "What are the functions of the human skeleton?" would be considered a high-level question (under most coding schemes), if asked to a group of students just beginning their study of the skeletal system. If, on the other hand, the teacher had spent the previous lesson listing functions on the chalkboard and warning students that there would be a quiz on the topic, the question would become a low-level, recall question.

Sociolinguists have pointed out this problem, and one (Cazden, 1986) concludes: "Thinking about questions in terms of some scale of cognitive difficulty is probably still heuristically useful for teachers, but inherently imprecise for research." Abandoning the research program may be an extreme reaction, however. Do challenging teacher questions make a difference in student learning? To answer that, we may need to broaden our conceptualization of question content.

Question content: Sociolinguistic research. There are two ways in which sociolinguistic research can contribute to a description of content in classroom questioning. First, it can provide the notion of discourse topic (Keenan & Schieffelen, 1976). What is being talked about in a question or a sequence of questions? How do speakers change topic? How do speakers react to attempts by other speakers to change the topic?

Classrooms are not characterized by equal participation rights among all speakers. In conversations outside classrooms, speakers use complex signals to indicate when they are finished speaking and when someone else may bid to

speak (Sacks, Schegloff & Jefferson, 1978), and any speaker may initiate a new topic of discourse. In classrooms, however, most of the time only teachers have the right to select a topic and take the first speaking turn (McHoul, 1978). Furthermore, the teacher alone allocates speaking rights (Mehan, 1979).

Topic can be traced in classroom discourse using the model of Bellack et al. (1966): in general, the teacher structures a topic, solicits students to talk about the topic (usually by asking a question), listens to the student response, then reacts to it (by, for example, saying "That's right."). A more economical version of this model, in which structuring and soliciting were combined into an "initiation" move and reacting was renamed "evaluation," was used by Mehan (1979) to describe all classroom discourse in a series of first grade lessons. Mehan's IRE (initiation-response-evaluation) model is a useful template for describing turn-taking and the development and changing of topic in classroom discourse.

A second way in which discourse analysis can inform researchers about question content is through propositional analysis. Green and Harker (1982) demonstrate how this sociolinguistic technique can be used to describe not only the patterns of communication (Bellack's or Mehan's models, for example), but also the subject-matter of discourse. From the sociolinguistic perspective, the two aspects -- interactional patterns and the topic of conversation -- are inseparable. The surface form of a question -- the order and choice of words -- does not provide enough information to determine whether it is a high cognitive level question. One must consider what came before it in discourse, and what rules govern answering the question.

Propositional analysis is one way of uncovering the effects of teacher subject-matter knowledge on both the topic of discourse and the use of

questions. A study by Hashweh (1985), for example, suggested that science teachers with deep understanding of their subject-matter differed from less knowledgeable teachers in the way they planned to question students in evaluation. High-knowledge teachers planned to ask about material not covered in the textbook, and required students to synthesize material. Low knowledge teachers tended to use questions emphasizing recall of material found in the textbook. Because Hashweh's study was a simulation, he did not collect any actual classroom discourse. Propositional analysis of discourse in actual science classrooms by Carlsen (1988) produced similar findings, however; teacher talk was more likely to follow the textbook when the topic of instruction was unfamiliar subject matter.

Summary: The content of questions. Process-product research has not produced a consistent set of findings on the contents of classroom questions, in part because the development of low-inference measures for describing content is problematic. Studies of indirect measures of question content have been conducted in relative isolation from one another.

Sociolinguistics provides a way of describing the subject-matter topic of a question, and contextualizing it in discourse. Unfortunately, it does so at the cost of increased complexity. It may not be realistic to expect that the sociolinguistic notion of topic will be useful in large-scale process-product research. The constructs of sociolinguistics may, however, be useful in research which is less directly concerned with the formulation of guidelines for effective teaching, and more concerned with the description of the relationship between speaker knowledge and discourse.

Responses and Reactions to Questions

Responses and reactions: Process-product research. How do teachers and students respond to questions and answers? Two areas have been studied extensively from the process-product perspective; these are wait-time and teacher praise.

In the first work on the subject of wait-time, Rowe (1974) identified two points in the cycle of teacher question, student response and teacher evaluation. Wait-time I was described as the period following a teacher's question, before a student answer. Wait-time II was described as the period following a student answer before the teacher begins speaking again.

A large number of studies have looked at the effects of wait-time; these were recently reviewed by Tobin (1987). Tobin, like Rowe in her original work, notes that increasing teacher wait-time from its typical length of under one second to over three seconds has a number of demonstrated effects, including: a decrease in the amount of teacher talk, fewer student verbal patterns repeated by the teacher, fewer teacher questions, fewer chained questions, more higher cognitive-level questions, fewer low-level questions, and more probing questions.

The most interesting findings of research on wait-time, for our purposes here, concern a possible interaction between wait-time and teacher thinking. Studies by Swift and Gooding (1983) and Fagan, Hassler & Szabo (1981) found that the cognitive level of teacher questions rose when teachers were trained to increase wait-time I and wait-time II. This suggests that there is an interaction between the mechanics of question delivery and their function in structuring the subject-matter. An experimental study by Tobin (1986), further disclosed that in extended wait-time classes, teachers talk less and interrupt

students less often.

Extending wait-time also has an effect on students' verbal participation in classes. Among the effects reported are an increase in the number of student utterances (Honea, 1982; Swift & Gooding, 1983; Tobin, 1986), the length of student utterances (Fagan et al., 1981; Honea, 1982; Swift & Gooding, 1983; Tobin, 1986), and the complexity and cognitive level of student responses (Fagan et al., 1981).

The effects of teacher praise are not as clear. A study by Stallings and Kaskowitz (1974), for example, found that teacher praise was positively correlated with some outcome measures and negatively correlated with others. Some researchers (e.g. Wittrock, 1986) have concluded that teacher praise functions not as a reward but as a source of information, and that it has an effect not on the student being praised, but on every student who is listening (Wittrock, 1978).

In both these areas of research, the paradigmatic distinction between process-product research and sociolinguistic research blurs a little. Rowe's original (1974) work, for example, was motivated by the study of intact patterns of teacher speech, not a quest for correlates to student achievement. Furthermore, attention to interrelationships between variables typically considered process variables hints at the multidimensionality of discourse context.

Responses and reactions: Sociolinguistic research. In addition to the contributions on discourse structure by Mehan (1979) and others, sociolinguistics has uncovered two interesting points concerning teacher questioning pertinent to our discussion here.

Research by Mishler (1975a, 1975b, 1978) suggests that students (in this

case first graders) react very differently to questions from their teacher than to questions from their peers (responses to teacher questions tend to be shorter and declarative; see also Boggs, 1972), and that students and teachers differ in the way they respond to questions in general. Teachers, for example, tend to "wrestle" control of the flow of discourse away from students who ask questions. Mishler argues that these and other characteristics of classroom discourse reflect role relationships between participants, especially along lines of authority and power. Unfortunately, his work ignores the educative nature of questions, and is thus of limited utility in interpreting classroom questions as tools in facilitating student learning.

Work by Dillon (1985) suggests that teacher questions in classrooms have the unintentional consequence of foiling student discussion. His analysis of five classrooms showed that teacher questions typically produced terse, factual statements by students, while non-interrogative expressions produced lengthier, more syntactically complex responses. Similar findings have been noted by others (e.g. Boggs, 1972; Edwards & Furlong, 1978).

Summary

While a great deal of process-product research has considered the relationship between teacher questions and student achievement, the most consistent results have been found in studies of wait-time, most of which substitute discourse measures for student achievement measures. Process-product research does suggest that cognitive level and teacher praise are related to some outcome measures, in certain well-defined contexts, but it cannot provide a clear theoretical picture of why the effects are irregular, nor can it provide a meaningful description of what those contexts are.

This analysis suggests some ways in which sociolinguistic constructs can be used to describe the social and linguistic context of classroom questions. Unfortunately, there is a cost. Sociolinguistic description of discourse requires so much time and attention to the details of conversation that it virtually precludes large-scale studies. Consequently, the arguments of sociolinguistics cannot be generalized easily using statistical inference.

Although the two paradigms concern themselves with different problems, they can inform each other. Minimally, sociolinguistics can suggest some of the facets of discourse that a process-product study should consider. Sociolinguists of education should consider the lessons of process-product research as well. For example, why does wait-time make a difference? The distinction between the two paradigms, while heuristically useful, should not obscure their common interest: the description of the process of education.

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